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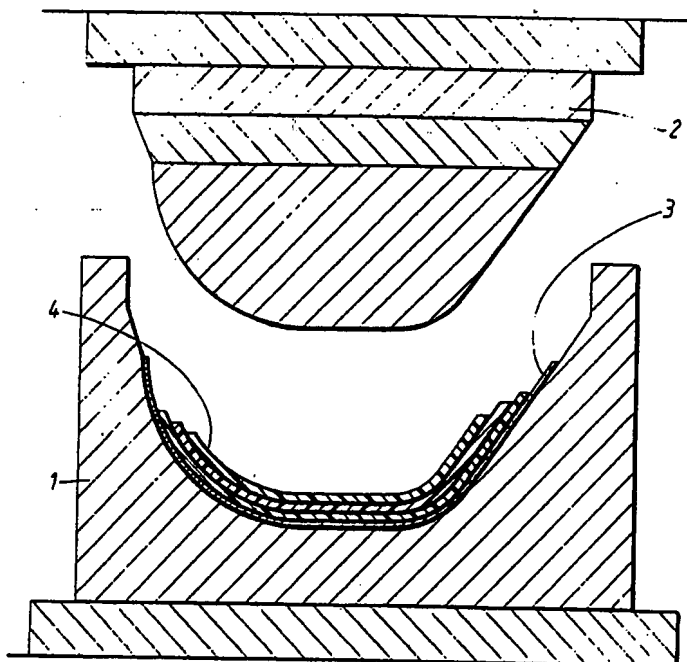
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(21) International Application Number: <b>PCT/SE92/00563</b> (22) International Filing Date: <b>19 August 1992 (19.08.92)</b> (30) Priority data: <b>9102387-9</b> <b>19 August 1991 (19.08.91)</b> <b>SE</b> (71) Applicant (for all designated States except US): <b>AB VOLVO</b> <b>[SE/SE]; S-405 08 Göteborg (SE).</b> (72) Inventors; and (75) Inventors/Applicants (for US only): <b>GÄNFÄLT, Bertil [SE/SE]; Tosthultsvägen 24 D, S-280 70 Lönsboda (SE).</b> <b>NYLINDER, Åke [SE/SE]; Vilshultsvägen 60, S-293 36 Olofström (SE).</b> (74) Agents: <b>GRAUDUMS, Valdis et al.; Albihn West AB, Box 142, S-401 22 Göteborg (SE).</b>			(81) Designated States: <b>JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE).</b>  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: **PRESSED, DISC SHAPED MATERIAL, USE OF THE MATERIAL AND METHOD FOR THE PRODUCTION THEREOF**



(57) Abstract

The invention relates to a pressed sheet-formed material which consists of a carrying layer of a glass mat reinforced thermopolymer material (GMT) (4) having an adhering thinner layer (3) of the same or some other polymer. The invention comprises also a method for the production of the material, which includes that one in a mould introduces the pre-formed film (3) and thereafter on this one puts the GMT-material (4) and finally presses the material together into a finished product at a pressure of preferably 150-200 bars.

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5      **TITLE:**

Pressed, disc shaped material, use of the material and method  
for the production thereof

10      **TECHNICAL FIELD:**

The present invention relates to a pressed sheetformed  
material which consists of plastics and glass fibres and  
which can be used as an equipment material in vehicles,  
15      buildings, e t c, especially as dashboard and equipment  
details in cars.

**PRIOR ART:**

20      An almost countless number of kinds of materials which are  
based on glass fibre reinforced plastics are known. Such  
materials can be used for many different purposes and their  
properties vary very strongly dependent on what kind of  
plastics, which are contained in the materials, and the way  
25      in which they have been produced. These materials are  
usually cheap and they have for most applications  
sufficiently good properties.

A known application for such materials are as equipment  
30      details in cars. In these the perhaps most dominant use of  
the plastic materials are as dashboards and as protection  
or shields at different places.

Dashboards for cars consist today mostly of a polyurethane  
35      plastics which is a foam material without mechanical  
strength with an outer layer of a plastic sheet. To give  
the dashboard sufficient mechanical rigidity the plastic

materials are mounted on an inner plate or the like. Apertures for different instruments in the dashboard are usually reinforced with plate details. The outer sheet should be mixed with plasticizers or for instance other plastic materials such as polyvinyl chloride to get the right properties. It is also usual that the outer layer is painted, partly to give the surface the right pleasant appearance, partly to prevent evaporation of additions to the plastics, which additions bring about so called fogging which means covering on the windscreens and the like.

#### TECHNICAL PROBLEM:

Production of for instance a dashboard according to the above is a complicated and expensive process. It is required that one first by punching out produces the plate part and treats this one so that the plastic material thereafter will adhere to the plate in a safe way and thereafter mould together plate, polyurethane and sheet in moulds. The residing time for such product in the mould after the application of the plastic materials on the plate part is very long, about 3-5 minutes, which means that one must have a great number of moulds to be able to bring about a continuous production. One has to calculate with 15-20 moulds plus punching tools for this purpose dependent on number of details per year.

Due to the fact that several plastic materials and plastic materials together with metal plates are parts of the product environment problems will arise both at the production and when the product later shall be destroyed by disintegration or is thrown away on some refuse tip.

It has therefore long been desired to be able to produce materials which can replace the above mentioned materials as equipment details such as dashboards and the like. These

materials should be environmental friendly and they should also be such that they allow a quicker and cheaper production of the details and have a lower weight.

5 THE SOLUTION:

By the present invention one has solved the problems at the known materials and their use and brought about a pressed sheetformed material consisting of a carrying layer of a  
10 glass mat reinforced thermopolymer (GMT) having an adhering thinner layer of the same or some other polymer.

It is according to the invention advantageous that the polymer in the GMT-material consists of polypropene having  
15 a material temperature of 190-200°C and the polymer in the thinner layer of polypropene with a melting point of 145-150°C.

The glass mat reinforced polymer GMT should have a content  
20 of glass fibres of about 30-40 weight-%.

The invention includes further use of the pressed material as a construction material for details or equipments in for example cars and airplanes, especially as dashboards.  
25

The invention comprises further a method for the production of pressed sheetshaped materials in accordance with the invention which is characterized in that one produces a pre-shaped thermoplastic film in a negative mould part whereupon one or more layers of flowable glass mat  
30 reinforced thermopolymers (GMT) at the flowing temperature is introduced into the mould on the pre-formed thermoplastic film and that the material thereafter is joined and formed by pressure and heat.

35

The thermoplastics in the film and in the GMT-material should be the same as those mentioned above.

5 According to the invention the positive mould part, that means the male part, should be cooler than the negative mould part, that is the female part, and have a temperature of 40-50°C, preferably  $42 \pm 2^\circ\text{C}$  and the negative mould part a temperature of 60-70°C, preferably  $62 \pm 2^\circ\text{C}$ .

10 The pre-formed film should according to the invention have a thickness of about 1,5-2,0 millimetres and should be embossed on that side that shall adhere to the GMT-material.

15 The joining and the forming of the material occurs by means of a pressure of about 150-200 bar ( $15-20 \text{ N/mm}^2$ ) and heat.

20 To obtain a successful result of the method the negative mould part should be embossed so that gases released can escape and the surface of the finished product get a pleasant appearance.

#### FIGURE DESCRIPTION:

25 The invention will in the following be described more in detail in connection with the attached figure, which in a vertical section shows the moulds pulled apart and with introduced materials intended to be pressed.

#### 30 PREFERRED EMBODIMENT:

35 In the figure a negative mould part 1 and a positive mould part 2 are shown. In the mould part 1 one has first introduced a pre-shaped and pre-pressed film 3 which in the present case consists of polypropene having a melt point of 145-150°C. The thickness of this film is about 1,5-2,0

millimetres. The reason for this is primarily that the negative mould part 1 is embossed so that air and gases are allowed to escape and that the film shall be able to receive this embossment form. If the film is too thick it will not get this embossment pattern, if it is too thin it will not be sufficiently strong. In the mould on the pre-shaped film 3 a number of layers of glass mat reinforced thermopolymer (GMT) adapted to full filling of details have been put in. This material consists in the present case of polypropene having a melting point of 190-200°C and the content of glass fibres in the polypropene is about 40 weight-%. Even other contents of glass fibres for example 27 or 30% can be thinkable as such are commonly available in the market.

To press the product the positive mould part 2 is pressed against the negative mould part 1 at a pressure of 120-200 bar (15-20 N/mm<sup>2</sup>). This pressure should be maintained during only about 20 seconds which means that introducing of materials, pressing and removing of the finished product requires 40-50 seconds or at most one minute. Compared to earlier known methods as mentioned above, this means a time saving of 3-4 minutes for each pressing.

As appears from the figure the GMT-material has been introduced into the mould in three layers having different size. It is important that the GMT-material is introduced in a proper way and in the present case this material has been adapted so that it shall flow upwards in the mould and fill this accurately. Therefore the three layers have been made in the way which is shown. During pressing the GMT-material flows out as mentioned and maintains also during the flowing the even distribution of glass fibres so that the product gets a homogeneous composition all through. The pre-formed film 3 does however not flow out as it abuts against a surface well under the melt point and maintains

its pre-pressed shape. This means also that the pre-pressed film 3 can be given folded edges in advance as the flowable GMT-material will fill up the cavities which are formed through this folding. Any folding of the film afterwards will therefore not be necessary and the joining of the film and the GMT-material occurs consequently completely in one single operation.

The negative mould part has as said above a temperature of 60-70°C whereas the positive mould part can be somewhat cooler and have a temperature of 40-50°C. Herethrough one gains the advantage that by cooling the film against the positive mould part the product will not attach to this which facilitates the removal of the product from the mould parts.

#### ADVANTAGES:

Through the present invention one gets the advantages that the production of press shaped products according to the above for example dashboards for cars, will be much cheaper and quicker compared to what is usual today. One obtains even better economy by the method and the product also by refraining from a carrying plate and besides that gets a lighter product. Any reinforcement of through going apertures in the product by means of a plate is neither necessary as the product has an inner strength which is sufficient.

The product and the method according to the present invention is also environmentally adapted. One gets a simpler production by which one avoids chemical treatment of the plates for improved adherence and at which environmentally dangerous waste besides that can be avoided. The only effluent gases which arise are small amounts of liberated propene at the pressing operation.



5       The finished product is in itself also environmentally friendly in that it comprises only one type of plastics, preferably polypropene. This facilitates highly the final destruction of the material which besides the plastics only contains glass fibres, which material as is well known is environmentally friendly.

10       The material according to the invention does not have the same tendency to so called "fogging" as earlier known materials. One can however if one so wishes paint the film before it is pre-pressed and introduced into the mould. This can also be an advantage also therethrough that it then can be given a more scratch-resistant surface.

15       The good attachment between the GMT-material and the thinner film, which partly is brought about therethrough that the bordering surface of the film against the GMT-material has been embossed in advance, makes also the strength at crashes larger. This strong attachment has also the consequence that splintering of the product in question by crashes is prevented. This is for security reasons much important, especially at cars.

20       The material according to the present invention is especially suitable as material in dashboards and equipment details for cars, airplanes and the like. It can however also be used for different purposes for example as glove lockers in cars, shields against cold air streams in the drivers compartment in lorries, as parts of the engine bonnet in lorries but also as equipment parts of different kinds for example in chairs and diverse furniture.

25       The invention is not limited to the embodiment example shown but can be varied in different ways within the scope of the claims.

## 5 CLAIMS:

- 10 1. Pressed, sheetformed material consisting of a carrying layer of glass mat reinforced thermopolymer (GMT) (4) having an adhering thinner layer (3) of the same or some other polymer.
- 15 2. Pressed material according to claim 1, characterized in that the polymer in the GMT-material (4) consists of polypropene with a material temperature of 190-200°C and the polymer in the thinner layer (3) of polypropene having a melt point of 145-150°C.
- 20 3. Pressed material according to any of the claims 1-2, characterized in that the glass mat reinforced polymer (GMT) has a content of glass fibres of about 30-40 weight-%.
- 25 4. Use of the press formed material according to any of the claims 1-3, as construction material or equipment details in for example cars and airplanes, especially as dashboards.
- 30 5. Method for the production of pressed sheetformed materials according to any of the claims 1-3, characterized in that one pre-formed thermoplastic film (3) is introduced in a negative mould part (1) whereupon one or more layers (4) of a flowable glass mat reinforced thermopolymer (GMT) at the flowing temperature is introduced in the mould (1) on the pre-formed thermoplastic film (3) and that the material thereafter is joined and formed through pressure and heat.
- 35

6. Method according to claim 5,  
characterized in that the thermoplastics in  
the film (3) consists of polypropene having a melt point of  
145-150°C and the GMT-material of polypropene with a  
5 material temperature of 190-200°C.

7. Method according to claim 5 or 6,  
characterized in that the positive mould part  
(2) has a lower temperature than the negative mould part  
10 (1).

8. Method according to claim 7,  
characterized in that the positive mould part  
(2) has a temperature of 40-50°C, preferably  $42 \pm 2^\circ\text{C}$  and  
15 the negative mould part (1) a temperature of 60-70°C,  
preferably  $62 \pm 2^\circ\text{C}$ .

9. Method according to any of the claims 5-8,  
characterized in that the pre-shaped film (3)  
20 has a thickness of 1,5-2,0 millimetres and is embossed at  
that side which shall adhere to the GMT-material.

10. Method according to any of the claims 5-9,  
characterized in that the joining and forming  
25 is carried out at a pressure of 150-200 bar ( $15-20 \text{ N/mm}^2$ )  
and heat.

11. Method according to any of claims 5-10,  
characterized in that the negative mould part  
30 (1) is embossed.

## AMENDED CLAIMS

[received by the International Bureau on 21 December 1992 (21.12.92);  
original claims 1-11 replaced by amended claims 1-7 (2 pages)]

- 5
1. Method for the production of pressed, sheet formed materials, characterized in that a pre-formed thermoplastic film (3) is introduced into a negative
- 10 mould part (1) whereupon one or more layers (4) of a flowable glass mat reinforced thermopolymer (GMT) at flowing temperature is introduced into the mould (1) on the pre-formed thermoplastic film (3) and that the material is thereafter joined and formed by pressure and heat.
- 15
2. Method according to claim 1, characterized in that the thermoplastic material in the film (3) consists of polypropene having a melt point of 145-150°C and the GMT-material of polypropene
- 20 having a material temperature of 190-200°C.
3. Method according to claim 1 or 2, characterized in that the positive mould part (2) has a lower temperature than the negative mould part
- 25 (1).
4. Method according to claim 3, characterized in that the positive mould part (2) has a temperature of 40-50°C, preferably  $42 \pm 2^\circ\text{C}$  and
- 30 the negative mould part (1) a temperature of 60-70°C preferably  $62 \pm 2^\circ\text{C}$ .
5. Method according to any of the claims 1-4, characterized in that the pre-formed film (3) has a thickness of about 1,5-2,0 millimetres and is embossed on that side which shall adhere to the GMT-material.
- 35

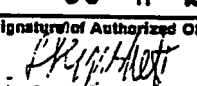
6. Method according to any of the claims 1-5, characterized in that the joining and forming is carried out at a pressure of 150-200 bar (15-20 N/mm<sup>2</sup>) and heat.

5

7. Method according to any of the claims 1-6, characterized in that the negative mould part (1) is embossed.

# INTERNATIONAL SEARCH REPORT

International Application No **PCT/SE 92/00563**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: B 32 B 17/04, 27/04, B 29 C 51/00</b>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	B 29 C; B 32 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with Indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	SE, B, 463548 (MOLYBON AGENTURER AB) 10 December 1990, see the whole document	1,3-4
Y A	--	2 5-11
Y	US, A, 4668729 (H KATAOKA) 26 May 1987, see the whole document	2
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
5th November 1992		09 - 11 - 1992
International Searching Authority		Signature of Authorized Officer
<b>SWEDISH PATENT OFFICE</b>		 <b>Anita Skeppstedt</b>

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 92/00563**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 30/09/92. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE-B- 463548	90-12-10	SE-A- 8803322 WO-A- 90/03256	90-03-21 90-04-05
US-A- 4668729	87-05-26	JP-A- 60190331 JP-B- 3067845 JP-A- 60149420	85-09-27 91-10-24 85-08-06